



Trimble LaserAce 1000 Accuracy Evaluation for Indoor Data Acquisition

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Commission 6



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June 2014





Introduction



- Indoor surveying has become an important factor in many different applications but a lack of standards is feeling and there are more challenges encountered in this field (Deak et al., 2012). According to Donath and Thurow (2007), considering various fields of applications for building surveying and various demands, geometry representation of a building is the most crucial aspect of building survey.



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Introduction



- In a surveying project, data acquisition, processing and modelling will be done separately which is time consuming and costly. This research is an attempt to overcome all procedures of surveying at once. Time and accuracy were considered as two important factors presented by this paper.



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- To investigate a new method of indoor surveying using a rangefinder:
 - cheap
 - less time consuming than other methods (laser scanning, Total Station)
 - comparable/reasonable precision
- To compare models reconstructed from data collected using 'well-known methods' (laser scanner and total station)

Laser scanner

- a point cloud needs to be processed to obtain a 3D model
- time consuming, but detailed and precise
- expensive equipment

Total Station

- x, y, z coordinates of points
- precise measurements

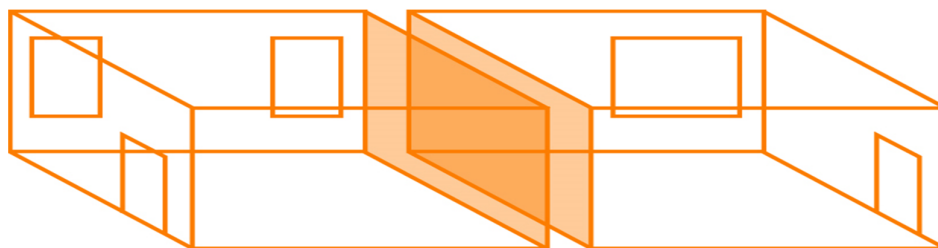
Rangefinder

- Advantages

- handy
- relatively cheap
- rapid measurements
- x, y, z coordinates

- Disadvantages

- not as precise as the laser scanner or Total Station



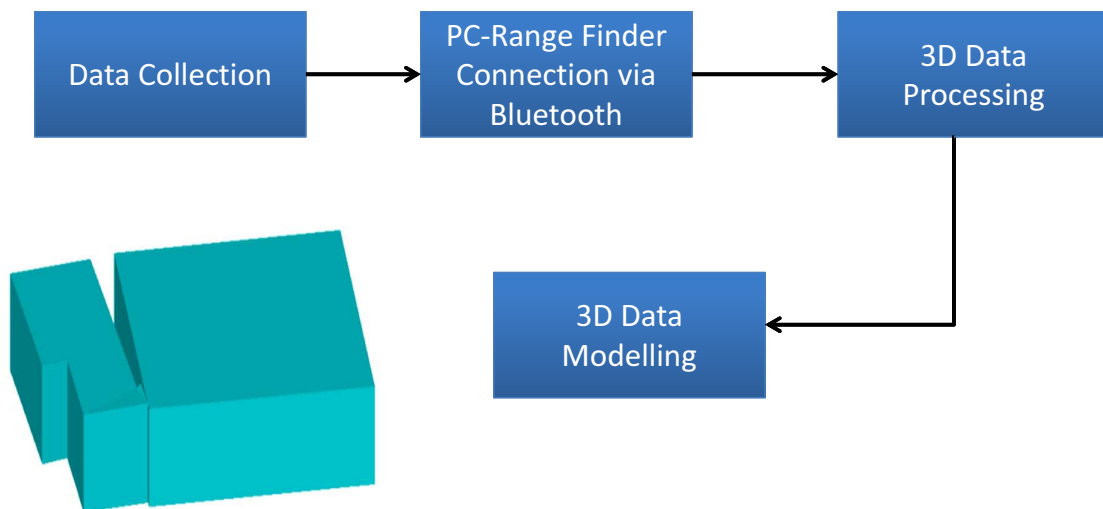
- User interface for 3D model construction on-site
- Adjacency relationship detected automatically
- Overlapping detection
- Hidden corner estimation

Useful when a simple geometrical model is required

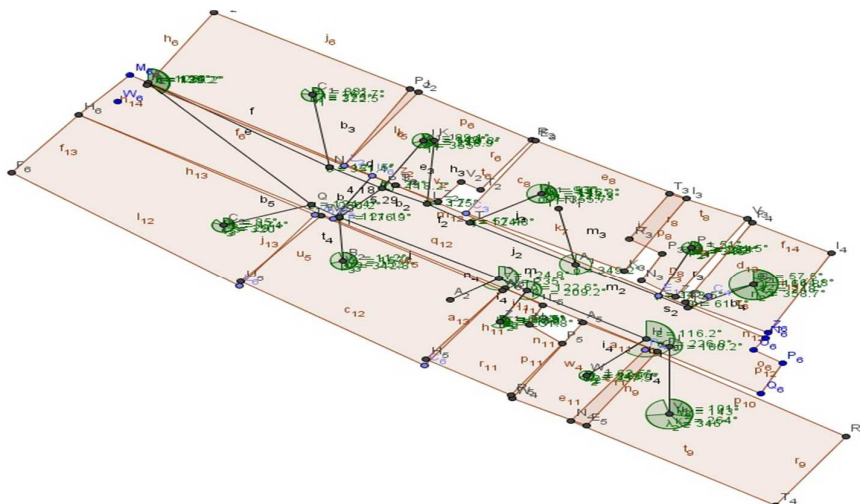
- I. for building management, inventorying, etc.
- II. emergency simulations

Useful when many rooms have to be quickly measured

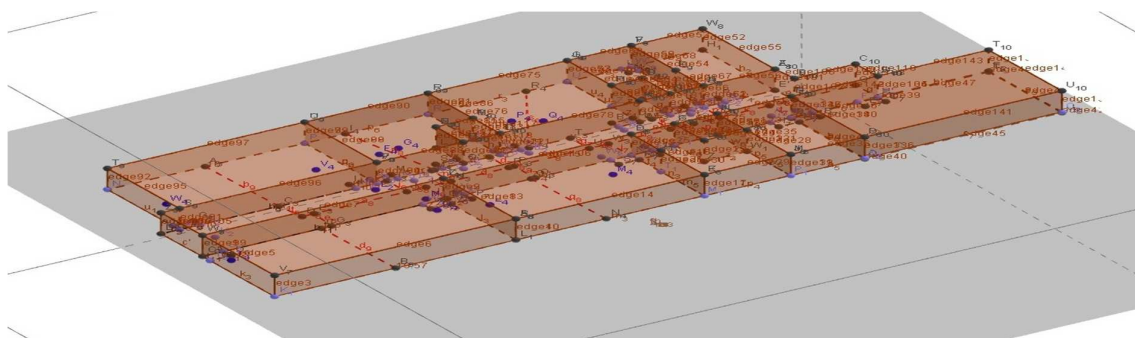
- I. buildings without architectural plans
- II. to compare the plans with as-build situation



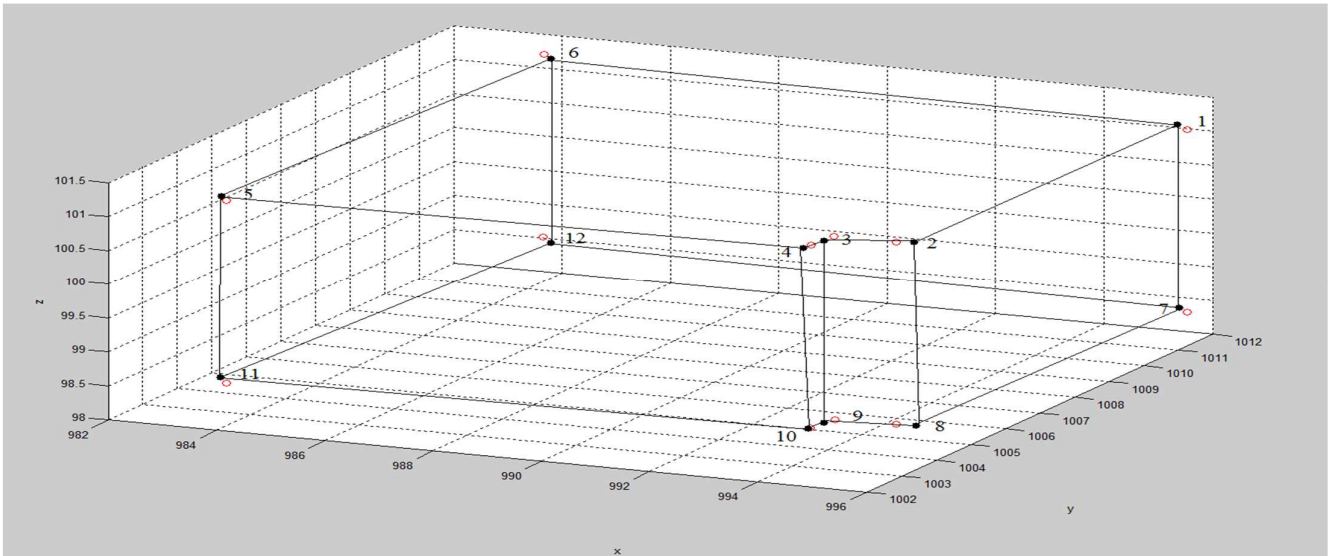
Coordinates measured by rangefinder is not as precise as laser scanner or total station measurement.



- Connection between PC and Range Finder by clicking the trigger (Fire Button) via Bluetooth
- Coordinates calculation (X Y Z) in PC

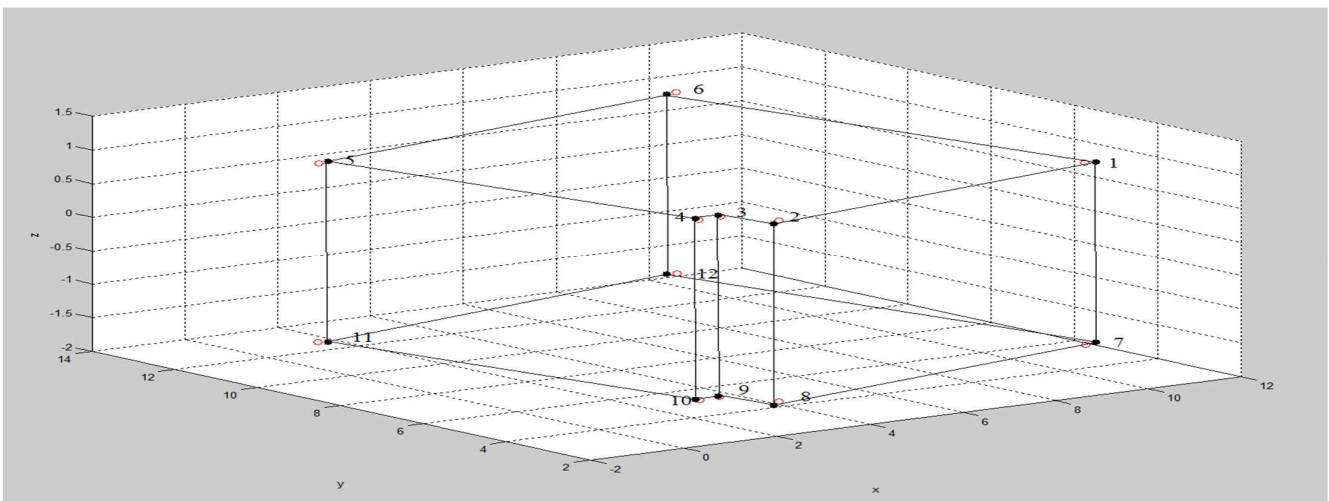


Rapid surveying method (result)



3D model calibrated and reconstructed based on the least square adjustment. (Trimble LaserAce 1000 (White) and Leica 307 TCR (Black))

Rapid surveying method (result)

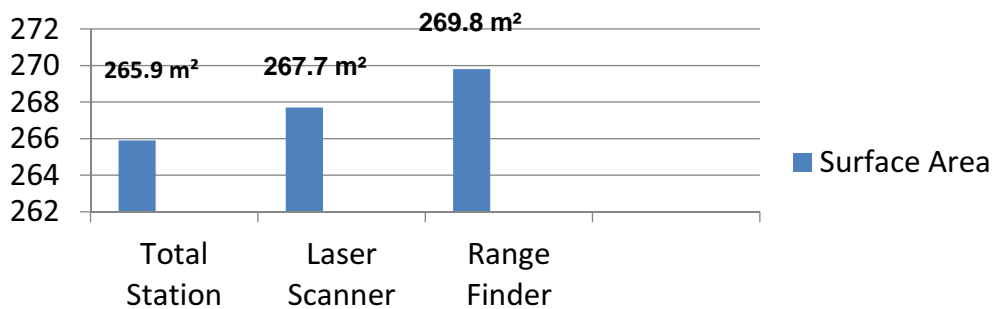


3D model calibrated and reconstructed based on the least square adjustment. (Trimble LaserAce 1000 (White) and Leica scanstation C10 (Black))

Rapid surveying method (result)



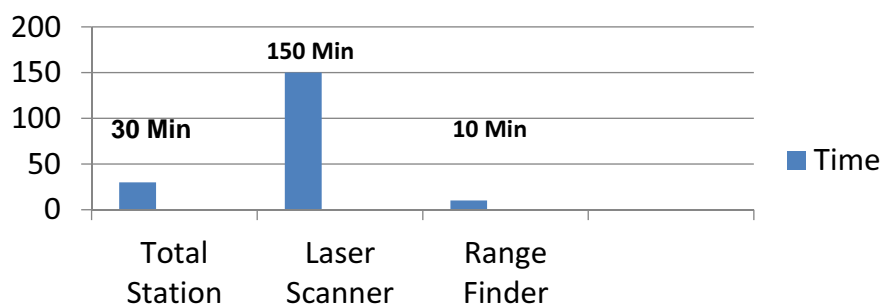
Surveying Equipments	Total Station (Leica 307 TCR)	Laser Scanner (Leica C10)	Range Finder (LaserAce 1000)
Surface Area	265.9 m ²	267.7 m ²	269.8 m ²



Rapid surveying method (result)

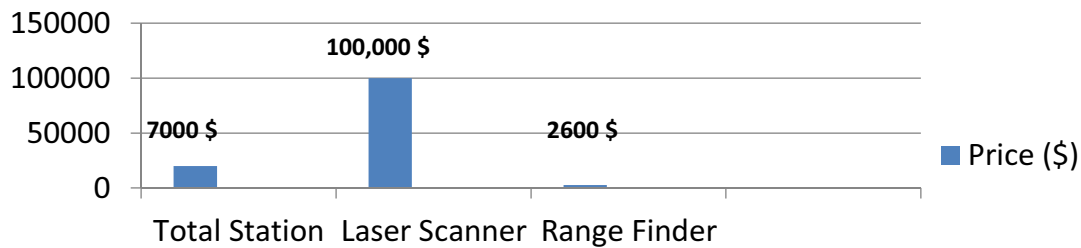


Surveying Equipments	Total Station (Leica 307 TCR)	Laser Scanner (Leica C10)	Range Finder (LaserAce 1000)
Time	30 Min	150 Min	10 Min



Rapid surveying method (result)

Surveying Equipments	Total Station (Leica 307 TCR)	Laser Scanner (Leica C10)	Range Finder (LaserAce 1000)
Price	+7,000	+100,000	2600



Conclusion

- This research has been done to investigate a technique of rapid indoor surveying and its accuracy in an indoor environment. The main objective of this research is to propose a methodology for data capturing and 3D modelling simultaneously.
- This research showed that reconstruction of 3D building model based on the geometry using Trimble LaserAce 1000 is inadequate and topology needs to be considered. The authors of this paper intend to investigate model reconstruction algorithms in the near future based on the geometry and topology modelling.



Acknowledgement



- Financial assistance from Malaysian Peninsula Land Surveyors Board (LJT).
- A special thanks to Prof. Dr. Alias Abdul Rahman



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Thank you for your attention

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